

THE ACULEATE WASPS AND BEES (HYMENOPTERA) OF NORFOLK AND PHILIP ISLANDS

I.D. NAUMANN

Division of Entomology, C.S.I.R.O., G.P.O. Box 1700, Canberra, A.C.T., 2601

Abstract

Ycaploca evansi Nagy (Scolebythidae); Dryinidae; *Primeuchroeus biroi* (Mocsáry) (Chrysididae); *Goniozus*, *Apenesia*, *Rhabdepyris* (Bethyidae); *Ariphron bicolor* Erichson (Tiphidae); *Liris festinans* (Smith), *Pison spinolae* Shuckard, *Pison caliginosum* Turner, *Pison glabrum* Kohl, *Pison marginatum* Smith, *Pison westwoodi* Shuckard (Sphecidae); and *Hylaeus* Fabricius (Colletidae) are recorded for the first time from the Norfolk Island-Philip Island group. The European wasp *Vespa germanica* (Fabricius), which established briefly, has been eliminated. Apart from the endemic *Scleroderma norfolcensis* Dodd (Bethyidae), which has reduced wings, all identifiable aculeate wasps and bees appear to be introductions, in most cases from the north or west (especially New Caledonia and Australia). Species which nest or shelter as adults in concealed situations or which parasitise the immature stages of Coleoptera in wood make up the bulk of the aculeate fauna.

Introduction

Norfolk and Philip Islands are tiny, remote and subtropical, and lie in the south-western Pacific Ocean, approximately equidistant from Lord Howe Island, New Caledonia and New Zealand. New Caledonia, about 680 km to the north-west is the nearest land mass.

Norfolk Island covers some 3450 hectares and reaches 316 m at its highest point. Philip Island, about 6.5 km distant, is a mere 250 hectares with a precipitous 280 m peak. The islands are the remaining, emergent peaks of the now largely submarine Norfolk Ridge which traces an angulate line from New Caledonia to New Zealand. The Ridge is part of an originally Gondwanan tectonic plate but the islands themselves are of relatively recent, volcanic origin (2.3-3.0 m.y.b.p., Jones and McDougal 1973; Holloway 1977).

It is unlikely that either island could have sustained life continuously until volcanic activity ceased. However it is possible that the present-day flora and fauna of the islands include elements from older, now submerged islands which were once near neighbours as part of a Norfolk Ridge archipelago (Moore 1985; Otte and Rentz 1985). The existence of such nearby islands has not been demonstrated conclusively but it is certain that Norfolk Island itself was once much larger than it is today - the original land mass has been diminished by perhaps 75% through erosion and sea level rises during the Pliocene and Quaternary (Anon. 1984).

Prior to human settlement about 200 years ago, Norfolk Island was covered extensively by closed, moist forest dominated either by Norfolk Island pines (*Araucaria heterophylla* (Salisb.) Franco) and other softwoods, or by palms and tree ferns. Early descriptions of

Philip Island indicate that this island originally had a more open natural vegetation of grasses, thickets, low trees and scattered Norfolk Island pines (Cogger, Sadlier and Cameron 1983). Since the arrival of man the vegetation of both islands has been altered greatly. Those forests not cleared from Norfolk Island have suffered massive weed invasions and introduced pasture grasses, guava (*Psidium* spp.), African olive (*Olea africana* Mill.), eucalypt trees, domestic gardens and buildings now cover more than 75% of the island. Through overgrazing by goats and rabbits the vegetation of Philip Island has been destroyed almost completely and ensuing erosion has removed most of the island's topsoil.

The composition and origin of the insect fauna of Norfolk and Philip Islands has been documented in part (e.g. Holloway 1977; Otte and Rentz 1985) but attention to the Hymenoptera has been sporadic and incidental. From a small collection made by A.M. Lea on Norfolk Island, Dodd (1924) recorded Hymenoptera for the first time and described several endemic, parasitic species. Hawkins (1942) noted additional parasitic species, several ants and the first nest-building wasp, an unidentified species of *Pison* Jurine (Sphecidae). Taylor (1967) and Wilson and Taylor (1967) provided additional taxonomic and distributional comment on the Norfolk Island ants. Turner, Smithers and Hoogland (1975) reiterated one of Dodd's (l.c.) records but omitted the others, and Holloway (1977) recorded eight wasp genera (including *Liris* Fabricius) for the first time from Norfolk Island. Up to now no Hymenoptera have been recorded from Philip Island.

In compiling the following annotated list of aculeate wasps and bees from Norfolk and Philip Islands, I have examined the specimens upon which Dodd (1924) published (material now in South Australian Museum, Adelaide, SAM) and more recently collected material in the Australian National Insect Collection, Canberra (ANIC) and the Australian Museum, Sydney (AM). To confirm the identity of species recorded from other islands in the south-west Pacific region I examined collections in the British Museum (Natural History), London (BMNH); Museum National d'Histoire Naturelle, Paris; the Naturhistorisches Museum, Vienna; the Zoological Museum, University of Copenhagen; the United States National Museum, Washington, D.C.; and the Bernice P. Bishop Museum, Honolulu. In particular I have examined type material of almost all species of *Pison* recorded from Australia and the south-western Pacific region. Nothing is known of the aculeate wasps and bees of Lord Howe Island. In the list below an asterisk indicates the first record of the taxon from the Norfolk-Philip Island group.

Key to the aculeate wasps and bees recorded from Norfolk and Philip Islands

(No attempt has been made to separate the apterous and micropterous females of Bethyliidae)

1. Body metallic green *Primeuchroeus biroi*
 Body not metallic green 2
2. Body with at least a few branched hairs 3
 Body without branched hairs 4
3. Forewing with 2 submarginal cells (Fig. 17)
 *Hylaeus (Prosopisteron) sp. nr asperithorax*
 Forewing with 3 submarginal cells (Fig. 16) *Apis mellifera*
4. Body with extensive yellow markings; forewings always present and folded longitudinally when at rest
 *Vesputa germanica*
 Body without extensive yellow markings; forewings present or absent, if present not longitudinally folded when at rest 5
5. Pronotum posterolaterally with rounded spiracle cover lobe (Fig. 1); forewing with 2 or 3 submarginal cells (Figs 18, 19) 6
 Pronotum usually without rounded spiracle cover lobe; if slight lobe developed (Fig. 15), then forewing with 1 submarginal cell 11
6. Anterior margin of each compound eye straight (Fig. 3); lateral ocelli much smaller than median ocellus (Fig. 4)
 *Liris festinans*
 Anterior margin of each compound eye strongly emarginate (Fig. 5); lateral ocelli not smaller than median ocellus (Fig. 6) 7
7. Forewing with 2 submarginal cells (Fig. 19) ... *Pison caliginosum*
 Forewing with 3 submarginal cells (Fig. 18) 8
8. Propodeum predominantly smooth, with only a few sparse, setigerous punctures (Fig. 8) *Pison glabrum*
 Propodeum not predominantly smooth (Figs 7,9,10) 9
9. Frons (Fig. 1) and propodeum (Fig. 7) with long hairs
 *Pison spinolae*
 Frons and propodeum without long hairs (Figs 2,9,10) 10
10. Mesoscutum and mesoscutellum with dense, fine punctures and interspaces engraved (Fig. 11); propodeum with prominent, oblique rugulae (Fig. 9) *Pison westwoodi*
 Mesoscutum and mesoscutellum more coarsely punctate and interspaces smooth (Fig. 12); propodeum without prominent, oblique rugulae (Fig. 10) *Pison marginatum*
11. Antennae inserted beneath frontal shelf *Ariphron bicolor*
 Antennae not inserted beneath frontal shelf 12

12. Antennae 10-segmented Dryinidae
 Antennae 12- or 13-segmented 13
13. Neck very elongate (Fig. 15) and forewing well-developed,
 with closed radial cell *Ycaploca evansi*
 Without the above combination of character states 14
14. Forewings absent or smaller than mid coxae Bethylidae
 Forewings larger than mid coxae 15
15. Forewing with closed radial cell (Fig. 20) *Sierola*
 Forewing without closed radial cell (Figs 21, 22)..... 16
16. Forewing without radial vein (Fig. 21) *Scleroderma*
norfolcensis
 Forewing with radial vein (Fig. 22) 17
17. Basal vein of forewing giving rise to a short vein *Goniozus*
 sp.
 Basal vein of forewing not giving rise to a vein 18
18. Mesoscutellum and propodeum medially contiguous (Fig.
 14)
 *Rhabdepyris* sp.
 Mesoscutellum and propodeum not medially contiguous (Fig.
 13)
 *Apenesia* spp.

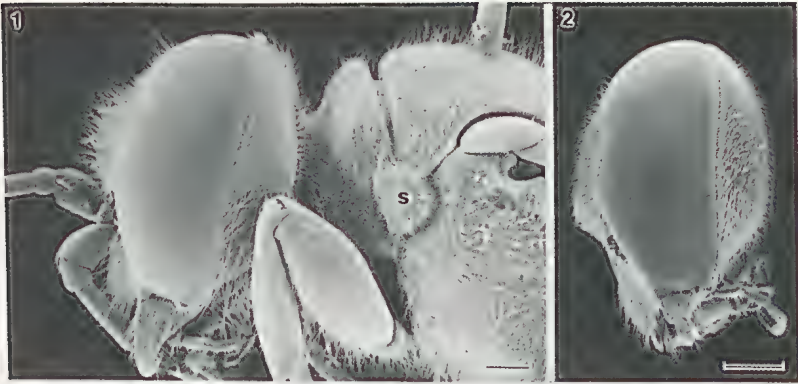
Family Scolebythidae

**Ycaploca evansi* Nagy. Scolebythids are primitive and uncommonly encountered aculeates. On Norfolk and Philip Islands *Y. evansi* has been collected under bark of *Lagunaria* sp. and by malaise and pan traps. This species is rare but widespread, the previously known range being southern Africa (including Cape Town) and eastern Australia (Stanthorpe, Sydney, near Moruya) (Nagy 1975). In southern Africa (where another primitive and possibly closely related family, the Plumariidae, also occurs) *Y. evansi* has been recorded as a gregarious parasite of *Hylotrupes bajulus* Linnaeus (Cerambycidae) in *Pinus radiata* D. Don. and of a different cerambycid in *Olea* (olive) (Brothers 1981). It is possible that *Y. evansi* was introduced accidentally to eastern Australia, Norfolk and Philip Islands, in beetle burrows in wooden sailing ships or in imported timber. For 200 years Cape Town has been a port of call for vessels sailing from England to Australia and there would have been ample opportunity for infestation to occur there. Conceivably the introduction of *Y. evansi* to Australia and the south-western Pacific region could date from the earliest years of convict transportation to Australia and Norfolk Island. An alternative explanation of the austral-disjunct distribution of *Y. evansi* is that the species is a Gondwanan relic.

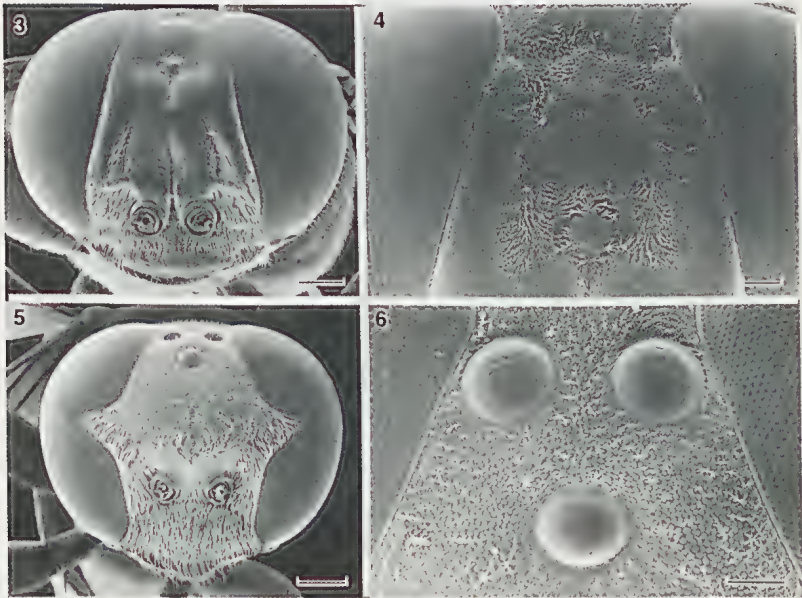
Norfolk Island: Anson Bay Reserve; Rocky Point Reserve.

Philip Island: South East Slopes; Lower Long Valley (ANIC).

Months of collection: November, December.



Figs 1-2. *Pison*, females: (1) *P. spinolae*, head and anterior mesosoma, lateral view; (2) *P. westwoodi*, head, lateral view. s, spiracle. Scale lines = 0.3 mm.



Figs 3-6. Frontal views of heads, females: (3,4) *Liris festinans*; (5,6) *Pison westwoodi*. Scale lines = 0.3 mm (3), = 0.1 mm (4-6).

Family Dryinidae

*One unidentifiable species of Gonatopodini occurs on both Norfolk and Philip Islands. Dryinids develop as ectoparasites of Fulgoroidea or Cicadelloidea (Hemiptera: Homoptera).

Family Chrysididae ("emerald wasps")

**Primeuchroeus biroi* (Mocsáry). Occurs also in eastern Australia and New Guinea where it parasitises nests of megachilid bees. On Norfolk Island probably parasitic on *Pison* spp.

Norfolk Island: Ball Bay; South Spur Track; Rocky Point Reserve; Selwyn Pine Road (AM, ANIC).

Family Bethyidae

Scleroderma norfolcensis Dodd. Endemic. Females submacropterous; males macropterous. Probably parasitic on larvae of Coleoptera in wood or litter.

Norfolk Island: South Spur Track.

Philip Island: Lower Long Valley (ANIC, SAM).

Month of collection: November.

Apart from *S. norfolcensis* none of the Bethyidae (8 spp.) known from Norfolk and Philip Islands can be identified to species. The widespread genera **Goniozus* (1 spp.; Philip Island only), **Apenesia* (2 spp.; Norfolk Island only), **Rhabdepyris* (1 sp.; Norfolk and Philip Island) and *Sierola* (1 sp.; Norfolk and Philip Island) are represented. Species of *Goniozus* and *Sierola* parasitise larvae of Lepidoptera, especially those feeding in concealed situations (e.g. rolled leaves, mines, tunnels in stems). Three additional species of Bethyidae are represented by extremely modified, females which cannot be placed to genus. One species (from Norfolk Island) resembles species of the Australian genus *Lepidosternops*. Both of the other species with apterous females have been recorded from Norfolk Island and one occurs also on Philip Island.

Family Tiphidae ("flower wasps")

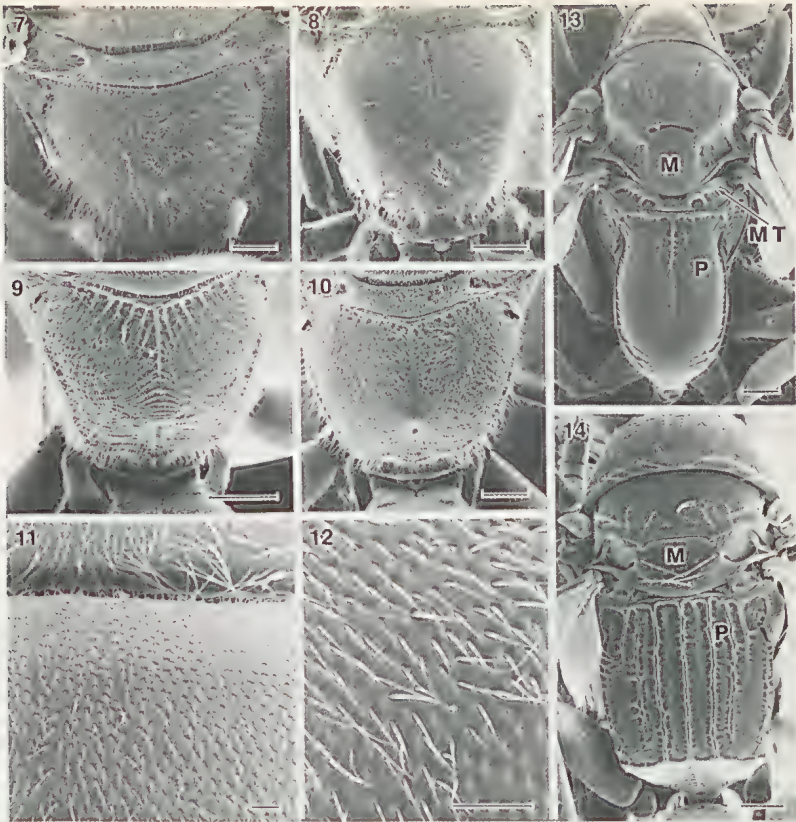
**Ariphron bicolor* Erichson. Known also from south-eastern Australia (New South Wales, South Australia, Victoria, Tasmania) (Brown unpublished). Parasite of larvae of Scarabaeoidea (Coleoptera) in soil.

Norfolk Island: Red Road.

Months of collection: November, December (ANIC).

Family Vespidae

**Vespa germanica* (Fabricius) ("European wasp"). A paper nest of this social species was discovered in Norfolk Island in 1982 and destroyed. A pest species, originally from Europe but accidentally introduced to and established in North America, Australia and New Zealand (Spradbery 1973; Edwards 1980). Queens hibernate in



Figs 7-14. Dorsal views of mesosoma, females (7-10, propodeum; 11, 12 mesoscutum): (7) *Pison spinolae*; (8) *Pison glabrum*; (9) *Pison westwoodi*; (10) *Pison marginatum*; (11) *P. westwoodi*; (12) *P. marginatum*; (13) *Apenesia* sp.; (14) *Rhabdepyris* sp. M, mesoscutellum; MT, metanotum; P, propodeum. Scale lines = 0.3 mm (7-11), = 0.1 mm (12-14).

concealed situations and are transported in packing cases, stacks of timber, folded cloth, etc. The species is common and widespread in Sydney, Melbourne, Tasmania and New Zealand and the introduction to Norfolk Island could have been from any one of these places.

Norfolk Island: unlocalised, 1982 (ANIC).

Sphecidae ("digger wasps", "mud dauber wasps")

**Liris festinans* (Smith). Widespread throughout the Oriental, Australian and Pacific regions (Indonesia, Australia, Solomon Islands, New Caledonia, Fiji, Samoa, Marianas, Caroline Islands, Vanuatu) (Bohart and Menke 1976). Common on Norfolk Island on bare areas of ground, especially beside dirt roads. Females excavate shallow

burrows in the ground (depth less than 13 cm) and provision these with small crickets (Orthoptera: Gryllidae) (Williams 1945).

Norfolk Island: Ball Bay, near Collins Head, Highlands Guesthouse, Point Hunter Reserve, Rocky Point Reserve, Selwyn Pine Road.

Philip Island: Lower Long Valley, Moo-oo Beach, National Park Hut, Rocky Valley, Upper Long Valley (ANIC).

Months of collection: March, April, November, December.

**Pison westwoodi* Shuckard. Known also from Australia and New Caledonia (as *P. strictifrons* Vachal) (Bohart and Menke 1976). Utilises various pre-existing, small cavities for its mud nests (e.g. mud cells of other species of *Pison*, cavities in wood). Females provision nests with spiders (Evans, Matthews and Hook 1981).

Norfolk Island: Highlands Guesthouse, Rocky Point Reserve.

Philip Island: Upper Dykes, Upper Long Valley (ANIC).

Months of collection: March April, November, December.

**Pison spinolae* Shuckard. (Sometimes referred to on Norfolk Island as a "mason bee" or "mason wasp"). An Australian species which has been introduced from Australia to New Zealand (Callan 1979). Females construct mud cells in protected situations (especially in holes and crevices in wood) and are seen commonly around buildings. The mud cells are provisioned with spiders (Callan 1979; Evans, Matthews and Hook 1981).

Norfolk Island; Ball Bay, Burnt Pine, Cascade, Highlands Guesthouse, mouth of Stockyard Creek, Rocky Point Reserve, Selwyn Pine Road (AM, ANIC, BMNH).

Months of collection: March, April, November, December.

**Pison caliginosum* Turner. Known also from Australia (Naumann, in press). Norfolk Island specimens of *P. caliginosum* differ from most Australian specimens in having dark tibial spurs and sparser punctation on the metasomal tergites. Biology unknown but probably also constructing mud nests and provisioning these with spiders. On Norfolk Island associated with less disturbed, forest habitats.

Norfolk Island: Rocky Point Reserve, Selwyn Pine Road (ANIC).

Months of collection: March, November, December.

**Pison glabrum* Kohl. Known only from Norfolk Island and Samoa (Yasumatsu 1953) but closely related to *Pison insulare* Smith from Hawaii and Vanuatu. Biology unknown but probably also constructing mud nests and provisioning these with spiders. On Norfolk Island associated with less disturbed, forest habitats.

Norfolk Island: Filmy Fern Valley, Red Road Track, South Spur Track (bottom) (ANIC).

Months of collection: April, November, December.

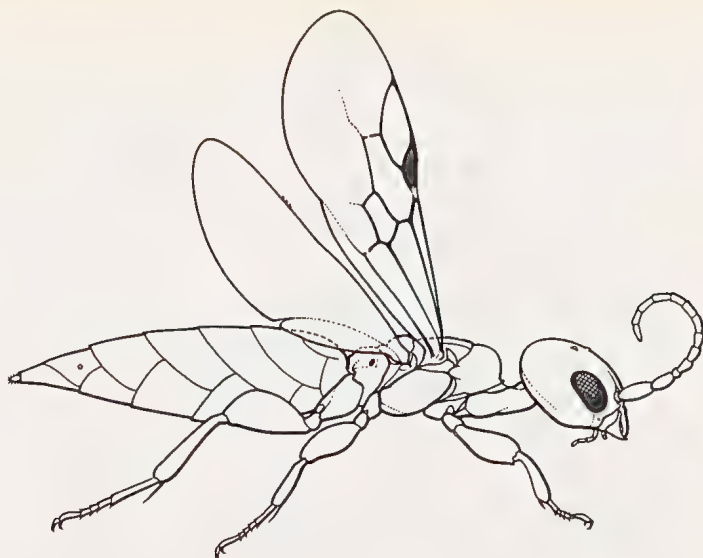


Fig. 15. *Ycalpoca evansi*, female. Body length (excluding antennae) = 5.2 mm. (Drawing by T. Nolan).

**Pison marginatum* Smith. Known from Australia, New Zealand, Norfolk Island and Philip Island. Females construct mud nests in pre-existing cavities (especially in wood) and provision these with spiders (Evans, Matthews and Hook 1981).

Norfolk Island: Cascade, mouth of Stockyard Creek (AM).

Philip Island: Lower Long Valley, Moo-oo Beach, Upper long Valley, Upper Dykes (ANIC).

Months of collection: March, April, November, December.

Family Apidae

Apis mellifera Linnaeus ("honey bee", "Italian bee"). Social. Cosmopolitan.

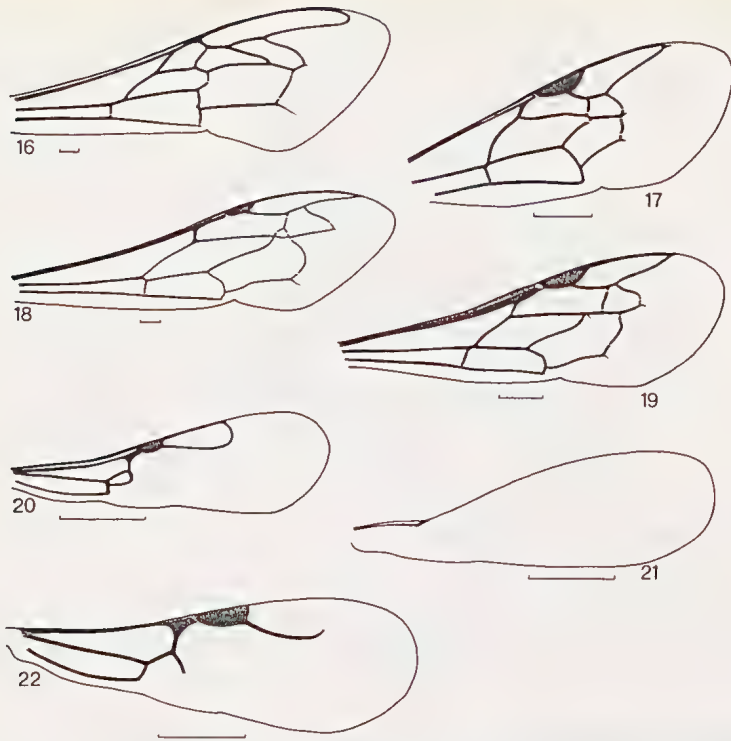
Norfolk Island: Highlands Guesthouse, mouth of Stockyard Creek, Red Road Track, Rocky Point, Selwyn Pine Road (AM, ANIC).

Philip Island: Lower Long Valley (ANIC).

Months of collection: March, November, December.

Family Colletidae ("native bee")

**Hylaeus (Prosopistemon)* nr *asperithorax* Rayment. *Hylaeus* is a large genus with species in Australia, New Guinea, the Chatham Islands, New Zealand and Tuamotu Islands. *H. (P.) asperithorax* is known from coastal localities near Melbourne and Sydney. Species of *Hylaeus* are solitary nesters. Nests consist of cells of transparent,



Figs 16-22. Forewings, females: (16) *Apis mellifera*; (17) *Hylaeus* (*Prosopisteron*) nr *asperithorax*; (18) *Pison spinolae*; (19) *Pison caliginosum*; (20) *Sierola* sp.; (21) *Scleroderma norfolcensis*; (22) *Goniozus* sp. Scale lines = 0.5 mm.

cellophane-like membrane in burrows in plant stalks, twigs or reeds, in pre-existing cavities such as beetle burrows in wood, and in the soil.

The nests of the Norfolk-Philip Island *Hylaeus* have not been located. On Philip Island adults were numerous on flowers of three creeping plants, *Melanthera biflora* (L.) M.Wild ("three-veined wedelia"), *Achyranthes aspera* L. ("chaff flower") and *Carpobrotus glaucescens* (Haw.) Schwantes. These plants are widespread and common in several of the valleys and on some beaches and are said to be "native" to Philip Island, rather than very recent introductions. Few specimens of the *Hylaeus* have been collected on Norfolk Island. It seems that the *Hylaeus* is well suited by present conditions on Philip Island where the low plants flower in abundance in open sunny areas. On Norfolk Island open areas are dominated by grasses and the bee is much less common. It has been stated (Anon. 1984) that "native bees [presumably the *Hylaeus*] were once common on Norfolk Island, but

.... their numbers have declined markedly, possibly following introduction of an Italian bee species".

Norfolk Island: Mouth of Stockyard Creek, Selwyn Pine Road (AM, ANIC).

Philip Island: Red Road Valley, Red Terraces, Whitewood Valley, Rocky Valley, Spin Beach, Upper Dykes, Upper Long Valley (ANIC).

Months of collection: March, April, November, December.

Acknowledgements

I thank (1) the curators of the collections listed in the introduction for permission to study specimens in their care; (2) Dr L. Kimsey, Museum of Comparative Zoology, Harvard, U.S.A. (Chrysididae); Dr G. Brown, Biological and Chemical Research Institute, Sydney (Tiphidae) and Dr T.F. Houston, Western Australian Museum, Perth (Colletidae) for the identification of some specimens; (3) the Australian National Parks and Wildlife Service, Canberra, and Mr L. Hill, Mr N. Hermes and Mrs M. Christian (all ANPWS) for assistance with field work; and (4) the following colleagues of CSIRO, Canberra: Ms K. Pickerd (for scanning electron micrographs), Mr C. Hunt (mounting and labelling line drawings), and Dr D.C.F. Rentz and Mr E.C. Edwards (comments on earlier drafts of this paper).

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